On the Fern Genus *Pyrrosia* Mirbel (Polypodiaceae) in Asia and Adjacent Oceania (2)

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(Received on June 19, 1996)

In this second part of the paper, an enumeration of the species from No. 23 to 64 is prepared. Two new species are described in this part.


Malaya: M.-Allen 3912 (SING), Henderson 19447, 22238, 25239 (PE, SING), Shimizu et al. 14353 (KYO).
Sumatra: Alston 13741 (BO), Borssum 1729 (BO), Hancock 89 (PE), 1892 (K), Lörzing 11926, 16937 (BO), de Wilde 12527 (BO).
Java: Backer 4861 (BO), von Leeuwen 290 (BO), Posthumus 1808, 4026 (BO), Raciborski s.n. (BO).
Flores: Schultz 3682 (BO), Lombok: Posthumus 1598 (BO), von Leeuwen 290 (BO), Posthumus 1808, 4026 (BO), Raciborski s.n. (BO).
Sumbawa: Kuswara 255 (BO), Rensch 677 (BO).
Timor: Jaag 989 (BO), Schmutz 2230 (BO), Teysman 16420 (BO).

Habitat: On tree trunks or on rocks at low elevations, or up to 1500 m altitude in Java.

Lectotype of *Niphobolus mollis* Kunze was typified by Ching as Zollinger 3183. Hovenkamp examined the lectotype specimen carefully and concluded that Zollinger 3183 is a mixture of some species including *P. penangiana* (K and BM) and only one specimen in BM (Zollinger 3761) represents *P. porosa* in the sense of this paper. *Pyrrosia mollis* is thus a synonym of this species as pointed out by Hovenkamp (1986).

Rhizome short creeping; scales lanceolate, long-acuminate at apex, entire; laminae oblanceolate, widest at above the middle portion, gradually narrowing towards almost sessile base, thin and fleshy in texture; induments monomorphic; upper surface of laminae glabrous, puncticulate, lower surface covered with only one layer of stellate hairs with aciculate rays; sori usually restricted near apex or on upper 1/3 of laminae.


*Cyclophorus subfissus* Hayata, Icon. Pl.


Chinese name: 西南石韦
Specimens examined. China. Yunnan: W.M. Chu 1621, 1774 (PE), K.M. Feng 2490, 3488 (PE), Henry 9061A (type of P. gralla, PE), Y. Jiang 16529 (PE), T.N. Liao 13640 (PE), B.Y. Qiu 54440, 54535, 771027 (PE), H.G. Zhou & P. Sun 54535 (PE); Sichuan: Q.H. Cheng 1710 (PE); China: H. Liu 1820 (PE); Hubei: H.C. Zhou 14219 (PE), H.F. Zhou 110932 (PE); Taiwan: Hayata s.n. (type of Cyclophorus subfissus, TI), Kawakami & Mori 2363 (type of Cyclophorus transmorrisonensis, TI), Suzuki St. 20626 (TI), Tagawa 372, 762, 1874, 3023, 3259, 3718, 3728 (KYO, MICH), Tamura et al. 20627 (KYO).

Habitat: Epilithic often on rocks in forests at 960–2700 m altitude.

This species is different from P. porosa in only one layer of stellate hairs with light brown, aciculate rays, the leaves with long subglabrous stipes, laminae elliptic-lanceolate, narrowed towards both ends, never enrolled, and with thinner texture. Pyrrosia transmorrisonensis was combined with P. mollis by DeVol in Flora of Taiwan. Based on the type and other Taiwan collections identified as this species, it is observed that they have only one layer of stellate hairs with aciculate rays and are identical with P. gralla. The type of P. matsudai (Y. Matsuda s.n., July 1919, Takao Prov., Taiwan, photo, hastate at base, but M. Inada s.n., Mutai in 1940 and T. Suzuki 30626, TI, are not hastate at base) has only one layer of stellate hairs with nearly aciculate rays and someone has empty sporangia; it may be a hybrid.


Chinese name: 華北石韦
Specimens examined. China. Common in North, Northwest and Central China, northwards to Liaoning, Inner Mongolia, eastwards to Shandong, southwards to Hunan. Representative collections are: Liaoning: Li et al. 176 (PE); Yang et al. 698 (PE); Shandong: Hokinson 1729 (PE), H.C. Wang 473 (PE); Inner Mongolia: W. Wang et al. 3097, 3276 (PE); Hebei: T.F. King 87 (PE), P.M. Liu 3065 (PE), S.E. Liu 4658 (PE), G. Sato 10160 (PE), S.W. Wang 62536 (PE); Shaanxi: K.S. Hao 4058 (PE), W.Y. Hsia 4322 (PE), T.P. Wang 1539 (PE); Gansu: Licent 5036 (PE), T.P. Wang 15089 (PE); Honan: L.H. Liu 1820 (PE), C.X. Shi 1940 (PE); Hubei: H.C. Chow 265 (PE), T.P. Wang 12033 (PE); Jehol: Nakai et al. 305, 307, 310, 316–318 (TI).

Habitat: Epilithic on rocks at 200–2000 m altitude.

This resembles the preceding species, but different from it in: plants smaller, fronds thinner in texture, stellate hairs shorter and appressed. These two seem to be geographic races of a species. There are specimens with empty sporangia, and some sporangia contain only 32 spores; P. × nipponica Beppu & Serizawa in J. Phytogeogr. Tax. 30: 45–47 (1983) may be in China and need to be revised.

26. Pyrrosiashenongensis Shing, sp. nov.
Species critica habitu P. fengii proxime similis differt, laminis tenuioribus, indumento
unistrati, stellato-pilosis cum lanceolati-radiis. A *P. pseudocalvata* laminis late elliptico-lanceolatis, basi cuneatis, non decurrentis, nervis lateralis utrinque manifestis, inferne ravidis, indumento tenuioribus.

**Chinese name:** 神衣石秀

**China.** Hubei: Shennongjia, Tagouwan, Hubei Shennongjia Exped. 20447 (type, PE), on rocks at elevation about 1000 m. altitude.

This new species is similar to *P. fengii* especially in its outline, though the induments are thinner, stellate hairs are grey with only one cell layer of lanceolate rays. This is again something similar to *P. pseudocalvata*, though laminae are broader, elliptic-lanceolate, cuneate at base, softly chartaceous in texture and not rigid coriaceous.


**Chinese name:** 紙質石秀


Habitat: Usually on rocks in forests or on tree trunks at 1000–2600 m altitude.

In appearance it is similar to a broad form of *P. lingua* in outline, though the induments are dimorphic: the lower layer of stellate hairs with rays of two kinds, or mixed with (1–)2–3–(5) frizzy woody rays among the lanceolate rays; the upper layer only sparsely covered with some dark brown stellate hairs with short lanceolate rays. The laminae are oblong, with caudate apex and thinner texture and always growing in forests.


**Cyclophorus lingua** Merr. in Lingn. Sci. J. 5: 19 (1927).


**Chinese name:** 琼岩石秀


Habitat: Epiphytic on tree trunks at altitude of up to 1650 m.

This species is distinct from *P. heteractis*
Niphobolus costatus Wal. (Thunb.) Ching in stipes longer than laminae and dense, greyish, stellate hairs; laminae oblong, round-obtuse at apex, thickly coriaceous in texture, glabrous and without punctures on upper surface. The stellate hairs are in one layer similar to P. heteractis with two kinds of rays, never covered with dark brown stellate hairs. Sori are hidden by dense indument. Distribution area is another distinct point of this species from P. heteractis.

29. **Pyrrosia fuohaiensis** Ching & Shing, sp. nov. (Fig. 1, 7–9)

Species indumenti arcte affinis **P. heteractis** (Mett. ex Kuhn) Ching, differt minore usque 5–7 cm alta, paleis integris, subulate lanceolatis, stipitibus laminis 3–5 pro brevioribus, laminis oblongis, obtuse acutis lateralis nervis in utroque manifestis.

Chinese name: 佛海石韲

China. Yunnan: C.W. Wang 73616 (type, PE), on tree trunks in mixed forests at about 1530 m alt.

This is similar to **P. heteractis** in indumenta, but the plants are smaller, 3–5 cm tall, with short stipes 1/3–1/5 as long as laminae; laminae oblong, obtuse-acute; rhizome scales subulate, lanceolate, entire.

Hovenkamp (1986) cited Wang 73616 in his notes under var. *heteractis* and considered that rhizome scales are entire throughout with deciduous cilia; actually the specimen of this number in PE is completely long-linear-caudate and never has any deciduous tracks.


Chinese name: 下延石韲


Habitat: On tree trunks or on rocks in forests at altitude of up to 2000 m.

Hovenkamp (1984) described a new species, **Pyrrosia platyphylla**, from Borneo based on the materials ever named as *P. costata*. He distinguished it from *P. costata* as: rhizome shortly elongate but not creeping; scales more or less abruptly narrowed upwards; costae having a central bundle with collenchyma, distinctly keeled when dried up, not quadrangular; upper epidermis with distinctly thick walls, hypodermis present. Combination of these characters is not seen in the materials from other localities.


Chinese name: 顯脈石韲

Specimens examined. China. Yunnan: W.M. Chu et al. 15110 (PE); Xizang: S.Z. Chen & B.S. Li 1708, 2351,
3297, 3976 (PE). Indonesia. Sulawesi: Hemippman 5036 (BO); Ambon: Brooks 17752 (BO), Rant 536 (BO), Robinson 1979 (BO); Ceram: Kato et al. 411, 420, 1627, 4792, and many others (TI), Rutten 341, 1769, 2008 (BO), Treub s.n. (BO); Bacan: Ramlento 934 (BO); Halmahera: Idjun 350 (BO); New Guinea: Brass 3556, 5492, 8859, 23703 (B, NY), Carr 12396, 74682 (B, NY), Clemens 10485 (GH), Grether et al. 4220 (US), Pleyte 530 (BO), Schlechter 16377 (B, PE).

Habitat: Epiphytic on rocks in forests or in thickets at 1100–2400 m altitude.

Larger plants; rhizome short ascending, scales basifixed, subulate lanceolate, acuminate at apex, suberrate, brown, hard; fronds ob lanceolate, obtuse-acute at apex, cuneate and decurrent downwardly, sometimes over 100 cm long, 4–9 cm wide, widest at above the middle portion; stipes covered with dense wooly hairs; upper surface of laminae glabrous, punctulate; induments on lower surface trimorphic, superficial layer with sparse hairs, bearing aciculate rays sometimes with long and dark brown dorsal spines at central portion, the next layer with narrowly lanceolate and wooly rays; lateral veins distinct; sporangia sessile.


Chinese name: 石枝


Habitat: Epiphytic on tree trunks or saxicolous at 400–700 m altitude.

Rhizome short, prostrate, scales light brown, lanceolate, subulate at apex, entire; laminae lanceolate, widest at below the middle portion, round-cuneate or slightly inaequilateral, coriaceous at base; induments dimorphic, stellate hairs dense, brown, upper layer with needle-like rays underneath covered by thinner layer of wooly rays, sometimes the upper layer deciduous and revealed grey, wooly hairs.


Chinese name: 截基石枝


Habitat: On rocks at altitude about 1500 m.

This is similar to P. bonii, but larger; rhizome short, lamina base subtruncate or rotundotruncate.


Habitat: Epiphytic in deep shade at 600–1500 m altitude.

General habit of plants is very similar to P. lanceolata, but the induments dimorphic; two layers of stellate hairs on laminae underneath, the upper layer with boat-like rays and the
lower with wooly rays.


*Niphobolus venosa* Blume, Fl. Jav. Fil. 63. t. 28. f. 1, a–d (1829).

Chinese name: 根頭石芽


Habitat: Epiphytic on rocks in broad-leaved forests at 280–800 m altitude.

This is similar to *P. costata* but different in: rhizome elongate, scales long-acuminate, sparsely short serrate, entire at apical portion; stipes in a half length as laminae; laminae elliptic-lanceolate, cuneate and short decurrent at base, texture thick-coriaceous, usually revolute; lateral veins distinctly convex; superficial layer of stellate hairs with narrowly lanceolate rays and brown, hard, long hairs at apical central portion sparsely; sori dispersed on whole the lower surface of laminae, not restricted to the upper portion.


Specimens examined. Borneo: Damaedi 267 (BO), Dransfield et al. 2214 (BO), Elmer 20659 (MICH), Endert 5217 (BO), Iwasaki et al. 974 (BO, KYO), Jahnri 302 (BO), Kato et al. 4146 (TI), Kostermans 5624, 5680a, 6047, 13308, 21403 (BO), Winkler 2736 (BO).

Habitat: Epilithic on rocks in light forests at lower elevations up to 600 m altitude.

This has long been confused with *P. costata* but differs in: rhizome elongate, scales more or less abruptly narrowed downwardly, costae in dried condition triangular in cross section, distinctly keeled, stomata superficial.


Specimens examined. Borneo: Boden Kloss 19052 (BO), W.L. Chew et al. 1727 (SING), Endert 3146, 4666 (BO), Jahnri 868 (BO).

Habitat: Epiphytic in lowland forests up to about 1000 m altitude.

This is similar in appearance to a larger form of *P. linguifolia*, especially in having distinct lateral veins, but the stellate hairs are dimorphic and thin deciduous, upper layer with subulate rays and lower layer with wooly rays.


*Pyrrosia linearifolia* (Hook.) Ching f.

Chinese name: 綠葉石秀

Japanese name: ピロードシダ

Specimens examined. China. Yunnan: Sino-USSR Exped. 5513 (type of P. pygmaea Ching in herb. PE); Jilin: S.X. Li et al. 1278, 5555 (PE), M. Noda et al. 154 (TI), J. Sato 10161 (TI), C.S. Wang et al. 3946, 4071 (PE), J.Z. Wang 3846 (PE); Taiwan: Gresitt 337 (K) Hancock 96 (K).

Habitat: Epilithic or epilithic on tree trunks or even on roofs of houses at lower elevations.

Plants of smaller size; laminae linear, stellate hairs loose, subdimorphic, upper layer brown with erecto-patent acicular rays, lower layer white with more or less crumpy rays; sori arranged in a single row on either side of costae, usually located only above the middle portion of laminae, hidden by hairs, or sometimes arranged in two rows or distributing up to lower portion of laminae. Variety heterolepis from Taiwan is characterized only by broader scales and distinct areoles. Pyrrosia pygmaea Ching in herb. from Monghai, Yunnan, is a much smaller form; laminae only 20–30 × 1.5–2.5 mm, scales short serrate at margin, without cilia, lamina apex short acute, stellate hairs sparse, growing on rocks by streams at about 1280 m altitude.


Chinese name: 相似石秀


Habitat: Epilithic on calcareous rocks on open slopes at 700–1200 m altitude.

Rhizome scales broadly lanceolate, acuminate at apex, usually lost the apical portion, brown, scariosus, ciliate at margin; fronds monomorphic, stipes 20–25 cm long, glabrescent; laminae as long as stipes or slightly longer, 4–5 cm broad, widest at or above the midst, elliptic-lanceolate, acuminate at apex, cuneate at base, thick-characeous, upper surface glabrous, sparsely punctulate and with a few stellate hairs with subulate-lanceolate rays underneath; sori distributed on a upper half of laminae underneath, distinct. Different from P. boothii in: laminae long-elliptic, margin slightly enrolled, texture rigid-coriaceous, lower side of laminae grey with white furfuraceous stellate hairs, powder-like or glabrescent, comparing with P. boothii with stellate hairs bearing multicellular stalks and long-aciculate rays; sporangia on stalks as long as capsules.


Chinese name: 越南石秀


Habitat: Epiphytic or epilithic on tree trunks or on rocks in forests at 80–1600 m altitude.
Rhizome scales lanceolate, acuminate at apex, slightly serrate or subentire at margin; fronds linear, subsessile, stellate hairs in two layers, superficial one with shortly monomorphic subulate scales and bottom layer with woolly rays thicker than those of *P. porosa*.


Chinese name: 平滑石筹


Habitat: On rocks in forests up to 1250 m altitude.

Smaller plants; rhizome slender, long-creeping, scales small and narrow, lanceolate, short acuminate at apex, light brown, entire, peltate; fronds monomorphic, with short stipes; laminae lanceolate or ovate-lanceolate, widest at below the middle portion, acuminate at apex, rounded or cuneate at base; lateral veins obvious; indument dimorphic, stellate hairs on lower layer with whitish wooly rays, those on upper layer with brown acicular rays and usually with long, dark brown, dosal spines; sori always apical; spores verrucose.


Chinese name: 波氏石筹


Habitat: On rocks in forests at 300–1000 m altitude.

Rhizome short elongate, scales subulate-lanceolate, entire, with tufted hairs at apex; fronds contiguous, stipes slender, as long as or longer than laminae; laminae oblong- or elliptic-lanceolate, short acute at apex, cuneate at base, 3–5 cm wide, thinner in texture, lateral veins indistinct; upper surface of laminae glabrous, less puncticulate, lower surface covered with two layers of stellate hairs, superficial layer sparsely covered with brown, long-subulate rays, bottom layer with white wooly rays.


Chinese name: 凝毡毛石筹

Specimens examined. China. Sichuan: numerous specimens, and K.Y. Lang et al. 1709 (type, PE), Shing & Lang 665 (PE); Shaanxi: B.Z. Guo 527 (PE); Gansu: K.M. Liou 10494 (PE); Hubei: G.X. Fu 731 (type of *P. pseudodrakeana*, PE); Guangxi: Y.K. Li 365 (type of *P. subcordata* Ching in herb. PE).

Habitat: Mostly epilithic, but sometimes epiphytic at about 1000–2300 m altitude.

Stellate hairs on the laminae underneath are without multicellular stalks and appressed, with narrowly lanceolate rays which are neither acicular like in *P. drakeana* nor boat-shaped as in *P. shearerii*. The lamina margin is often irregularly lobate. This may be originated through hybridization.


*Acrostichum obovatum* Blume, Enum. Pl.


Chinese name: 靜參石筍


Habitat: Epilithic on rocks at 400–950 m altitude.

Rhizome slender, creeping, bearing two rows of dimorphic fronds with very short stipes; sterile laminae suborbicular, cordate or rounded at base; fertile laminae lanceolate, obtuse or moderately acute at apex, cuneate at base; texture fleshy, upper surface of laminae unpunctate, covered by sparse stellate hairs with aciculate rays, stellate hairs on lower surface of laminae in two layers, superficial layer with long stalks and brown acicular rays, fluffy, bottom layer with white, sparse, wooly rays; some plants with oblong sterile laminae are named *P. obovata* or as a variety of this species.


Specimens examined. Borneo: Clemens 26984, 27327, 27479, 33229 (BO, GH), H.F. Sun 198 (PE), Holttum 25358 (BO, SING).

Habitat: Epiphytic at 1000–1500 m altitude.

Similar to *P. rasamalae* (Racib.) Shing in habit and induments and differs from it in: rhizome scales subulate-lanceolate, with long cilia at margin and apex.


Chinese name: 狭葉石筍


Habitat: On tree trunks or on wet rocks in shade at 1800–2200 m altitude.

Closely related to *P. tonkinensis* (Gies.) Ching and different from it in: laminae belt-like, 30–50 cm long, 1–2 cm wide, usually decurrent towards base, subsessile, chartaceous in texture, margin often enrolled in lower portion; induments much thinner; sori sparsely distributed; sporangia sessile or with short stalks.

Specimens examined. Java: Alston 12459, 12786 (BO), Backer 372, 3607, 10882, 11352, 12258, 12356 (BO), Backer & Posthumus 23, 75, 168, 368, 555 (BO), Forbes 1003 (K, PE), Mousset 81 (P), Palmer et al. 774 (US), Posthumus 209, 1750, 1770, 1807, 2884, 3711, 3796 (BO), Raciborski 133 (BO), H.F. Sun 1941, 7018 (PE), Sumatra: Brooks 15833 (BO), Forbes 2547b (K), A. Joeb 329 (US), van Steenis 3884 (BO), Bali: Posthumus 3711, 3693 (BO), van Steenis 8010 (BO). Flores: Posthumus 3216 (BO), Rensch 1525 (BO).
Habitat: On tree trunks or on rocks between 700–1500 m altitude.
This species is different from P. floccigera (Bl.) Ching in its thick rhizome covered with fluffy and persistent scales; scales ovate-lanceolate, widest at above the attached point.

Specimens examined. Philippines: Edaños 20643-2 (MICH), Elmer 9042, 22255, 22325 (MICH), Merill 3820 (GH), Topping 413, 480 (MICH), Williams 683, 1476 (US). Malaya: Henderson 21697 (BO, SING), Hottltum 25304 (BO, SING). Sumatra: Borssum 2080, 2274, 2322 (BO), Damaedi 125 (BO), Hottltum 28113 (BO, SING), H.F. Sun 6806 (PE), de Vogel 2927 (BO). Java: Backer 25395 (BO), Backer & Posthumus 76, 304, 369 (BO), Mousset 32, 154, 768 (P), Posthumus 76, 1536, 3555 (BO), van Steenis 2414, 11097 (BO), H.F. Sun 7014, 7114 (PE). Bali: Posthumus 3655, 3744 (BO); Lombok: Rensch 319 (BO); Sambawa: Kostermans 18281 (BO); Rensch 666 (BO); Timor: Posthumus 3209, 3372 (BO).
Habitat: Epiphytic on tree trunks at 500–1600 m altitude.
Rhizome scales peltate, fluffy, lanceolate, caudate-acuminate at apex, light brown, entire; fronds monomorphic; laminae linear, 2–10 mm wide, chartaceous in texture, usually revolute at margin; indument monomorphic, in two layers of stellate hairs on lower surface of laminae, superficial layer with brown and sparse needle rays and bottom layer with woolly rays; upper surface of laminae plane, not puncticulate.


Habitat: Epiphytic or epilithic on tree trunks or on rocks up to 3900 m altitude.
This is confused with P. albicans by Hovenkamp but is different from it in: rhizome slender and long-creeping, scales linear-subulate with long tails, hairy or subentire at margin, deciduous, but not broadly lanceolate, acuminate at apex, dentate at margin, fluffy, persistent as in the other species.

Specimens examined. Indonesia. Sumatra: Beccari 458 (K), Bunnemeier 5153, 9004, 9043, 9316, 9426, 9582, 10210, 10215 (BO).
Habitat: Epiphytic on tree trunks in montane forests.
This seems to be similar to P. lanceolata (Alston) Morton in outline, but the rhizome scales have sheathing base extending further down from attached point and curved downward.


Pyrrrosia porosa (Pr.) Hovenk. var. porosa;

Chinese name: 裸茎石韦

Specimens examined. China. Yunnan: Forest 10108 (type, PE), 20108, 20374 (PE), T.T. Yu 23009 (PE), C.W. Wang 19748, 64132, 65188, 69306, 69337 (PE), K.M. Feng 2639, 7093 (PE), H.T. Tsai 63012 (PE), R.C. Ching 25236, 24771 (type of P. scolopendrium, PE); Sichuan: C.J. Xie 40210 (PE).

Habitat: Epiphytic on tree trunks or epilithic on rocks in forests at 1600–3400 m altitude.

This is very similar to P. porosa (Pr.) Hovenk. var. mollissima (Ching) Shing but different from it in: rhizome scales ovate, short acuminate at apex, lucid, dark brown, with narrowly grey-brown and short ciliate at margin, upper surface scabrid; laminae lanceolate, gradually attenuate into stipes, upper surface glabrescent, sparsely punctulate, lower surface with one layer of thin stellate hairs; stipes glabrous or with a few hairs. Pyrosia scolopendrium is distinguished only by thinner texture of laminae and indument; probably a shady ecotype.


Chinese name: 柔軟石韦

Following two varieties are recognized:

1(a) Rhizome scales long-ciliate; densely covered by stellate hairs on stipes to costae ..................... var. porosa

1(b) Rhizome scales lanceolate, brown, or blackish at attached point; subglabrous or with a few hairs on stipes to costae ..

.............................................. var. mollissima

a. var. porosa


Habitat: Epilithic or epiphytic on rocks or on tree trunks at 900–2500 m altitude.

Asian botanists followed Ching in applying P. mollis (Kunze) Ching to the species now named as P. porosa (Pr.) Hovenk. until Hovenkamp (1984) corrected the name of this species: the lectotype of Niphobolus mollis Kunze by Ching was Zollinger 3183 which is a mixture of the collections of some species and not including the species here called P. porosa (Pr.) Hovenk.

This is a species variable in size and form of plants. Similar to P. gralla (Gies.) Ching in various features but different from it in: stipes shorter, covered with thick stellate hairs; laminae thicker in texture, revolute in dry season, up-
per surface puncticulate, subglabrous, lower surface covered with two layers of stellate hairs, superficial one with aciculate rays, and bottom layer with thick, woolly rays. Sometimes there are monstrous fronds with 2–3 times dichotomously forked at apex: this form is named Cyclophorus alcicornus by Christ.


Habitat: Epithilic on rocks at 900–2100 m altitude.

Larger form of the species: laminae thinly coriaceous in texture, with thinner indumentum, plane when dry, with lateral veins distinct.


Chinese name: 曼氏石齿


Habitat: Epiphytic on tree trunks at up to 1200 m altitude.

Rhizome short, not grooved ventrally, phyllopodia contiguous, scales pseudopeltate, lanceolate, long-acuminate, brown, entire; fronds monomorphic, short stipitate, elliptic-lanceolate, widest at or above the middle portion, narrowed towards both ends, long decurrent at base, with short and densely hairy stipes or sessile, upper surface distinctly puncticulate; indumentum dense, dimorphic, stellate hairs of superficial layer with brown aciculate rays and bottom layer with white frizzly, visible, wooly rays.


Specimens examined. Bhutan: Hara et al. 11309 (TI), Kanai 5539, 11309 (TI). India: Levinge s.n. (K).

Habitat: Epithilic or epiphytic at middle elevations.

Rhizome scales lanceolate, acuminate at apex, sparsely dentate at margin, attached at a little below the very center; laminae elliptic-lanceolate, length/width proportion about 3:1, acute or acuminate at apex, cuneate at base; petioles slightly shorter than laminae; indumentum dimorphic, stellate hairs of upper
layer with acicular rays, those in lower layer with wooly rays.

Hovenkamp (1986) recorded this species from China; he considered that Pyrrosia fengiana Ching and P. latifolia Ching & S.K. Wu were identical with P. boothii (Hook.) Ching. Hovenk., Monogr. Pyrrosia 258 (1986); von Rosthorn 1707 might be from eastern part of Xizang, just adjacent to Sichuan.


Specimens examined. Sri Lanka: Thwaites 1294 (type, K).

Habitat: Epilithic on rocks or terrestrial in forests at low altitudes.

This is similar to P. heteractis, but hydathodes are distinct, induments are dimorphic: the stellate hairs of upper layer with uniformly aciculate rays and of lower layer with wooly rays.


Specimens examined. Sri Lanka: Waas 56461 (K), Fosberg 57274 (US), Faden 76/334 (K), Layalla 112 (K), Thwaites 988 (K), Wall 48/293 (K).

Habitat: Epiphytic or epilithic at low elevations.

Rhizome short creeping, scales pseudopeltate, lanceolate, acuminate at apex, broadened at base, dark brown, long-ciliolate; stipes 15–20 (–30) cm long, densely clothed with light brown deciduous stellate hairs; laminae 16–32 cm long, 4.5–10 cm broad at middle, gradually narrowing towards both ends, elliptic or broadly lanceolate, punctate with calcareous dots on upper surface, induments on lower surface dimorphic, upper layer consisting of brown stellate hairs with long needle-like rays, lower layer with grey, frizzy, wooly rays; sori confined to the upper half of laminae underneath, hidden by induments when young and appearing in maturity.


Chinese name: 馮氏石蓮

Specimens examined. China. Yunnan: K.M. Feng 7977 (type, PE); Xizang: Qingzang exped. 5580 (type of P. latifolia, PE).

Habitat: On boulder under woods by bank of the Salwin River, or on tree trunks or on rocks in forests at 1650–1800 m altitude.

Rhizome short creeping, scales pseudopeltate, lanceolate, acuminate at apex, broadened at base, dark brown, long-ciliolate; stipes 15–20 (–30) cm long, densely clothed with light brown deciduous stellate hairs; laminae 16–32 cm long, 4.5–10 cm broad at middle, gradually narrowing towards both ends, elliptic or broadly lanceolate, punctate with calcareous dots on upper surface, induments on lower surface dimorphic, upper layer consisting of brown stellate hairs with long needle-like rays, lower layer with grey, frizzy, wooly rays; sori confined to the upper half of laminae underneath, hidden by induments when young and appearing in maturity.
Sichuan, Yunnan, South Shaanxi, and Southeastern Kansu, northwards to Eastern Hubei and Southern Honan; some notable collections are: Hubei: Wilson 2629 (K); Yunnan: K.M. Feng 2380, 3413 (PE); Forrest 13119 (K), H.T. Tsoi 51491, 59924, 59986 (PE), C.W. Wang 6410, 69145 (PE); Sichuan: W.P. Fang 3966, 4539 (PE); Xizang: Qinghai-Xizang exped. 73-166 (PE); Taiwan: Bartlett P. drakeana. Based on a specimen kept in PE identified by Hooker (PE).

Habitat: On rocks or on tree trunks up to 1200 m altitude.

A narrow-leaved form of this species has been recognized as Niphobolus inaequalis. Based on a specimen kept in PE identified by C. Christensen, the indumenta of this form are found to be similar to those of typical form of *P. drakeana*.


Chinese name: 絨毛石蕨

Specimens examined. China. Guangdong: S.P. Ko 51035 (PE); Guangxi: L.Q. Cheng 93296 (PE), S.K. Lau 4585 (PE), R.H. Shan 856 (PE); Guichou: Cavalerie s.n. (P); Yunnan: W.M. Chu 3306, 4763, 5139, 11533 (PE), Hancock 53 (K), T.N. Liu 18471 (PE), H.T. Tsoi 53252 (PE); Sichuan: Boufford et al. 24143 (GH); Hubei: H.C. Chow 857, 1940 (PE), H.J. Li 4949 (PE), Sino-Amer. exp. 1110 (type of *P. pseudocalvata*, PE), Gh. 1429, 1663 (GH, PE); Hunan: G.C. He 4938 (PE); Zhejiang: K.K. Tsooong 4531 (PE), J.X. Wang 1548 (PE); Shaanxi: G.Y. Bai 20 (KUN); Gansu: Y.Q. He 1337 (PE). Burma: Rains 1942 (K). Vietnam: Sino-Vietnam Exp. 24. 385 (KUN, PE).

Habitat: Epiphytic or epilithic on tree trunks or on rocks in forests at 400–1750 m altitude.

This species is different from *P. subfurfuracea* from the Himalayas in: laminae green and subglabrescent on undersurface, lanceolate, gradually narrowing towards both ends, decurrent at base, undersurface of laminae clothed with two layers of stellate hairs when young, hairs of lower layer consisting of grey, short, and indistinct frizzy rays, the hairs of superficial layer with brown, long-aciculate rays, deciduous, only a few brown hairs or occasionally some grey ones on stipes and leaf margin; rigid coriaceous in texture.


*Cyclophorus esquierl* Lév., Fl. Kow-Tcheou 478 (1914).


Chinese name: 光叶石蕨

Specimens examined. China. Guangdong: S.P. Ko 51035 (PE); Guangxi: L.Q. Cheng 93296 (PE), S.K. Lau 4585 (PE), R.H. Shan 856 (PE); Guichou: Cavalerie s.n. (P); Yunnan: W.M. Chu 3306, 4763, 5139, 11533 (PE), Hancock 53 (K), T.N. Liu 18471 (PE), H.T. Tsoi 53252 (PE); Sichuan: Boufford et al. 24143 (GH); Hubei: H.C. Chow 857, 1940 (PE), H.J. Li 4949 (PE), Sino-Amer. exp. 1110 (type of *P. pseudocalvata*, PE), Gh. 1429, 1663 (GH, PE); Hunan: G.C. He 4938 (PE); Zhejiang: K.K. Tsooong 4531 (PE), J.X. Wang 1548 (PE); Shaanxi: G.Y. Bai 20 (KUN); Gansu: Y.Q. He 1337 (PE). Burma: Rains 1942 (K). Vietnam: Sino-Vietnam Exp. 24. 385 (KUN, PE).

Habitat: Epiphytic on tree trunks in forests at 750–1900 m altitude.

This species is similar to *P. calvata* in appearance but different from it in: rhizome scales lanceolate, long-caudate at apex, entire; lower surface of laminae greyish blue, stellate hairs dense, persistent, with short curly rays, and often furfuraceous or powder-like in maturity.


*Cyclophorus esquierl* Lév., Fl. Kow-Tcheou 478 (1914).


Chinese name: 光叶石蕨

Specimens examined. China. Guangdong: S.P. Ko 51035 (PE); Guangxi: L.Q. Cheng 93296 (PE), S.K. Lau 4585 (PE), R.H. Shan 856 (PE); Guichou: Cavalerie s.n. (P); Yunnan: W.M. Chu 3306, 4763, 5139, 11533 (PE), Hancock 53 (K), T.N. Liu 18471 (PE), H.T. Tsoi 53252 (PE); Sichuan: Boufford et al. 24143 (GH); Hubei: H.C. Chow 857, 1940 (PE), H.J. Li 4949 (PE), Sino-Amer. exp. 1110 (type of *P. pseudocalvata*, PE), Gh. 1429, 1663 (GH, PE); Hunan: G.C. He 4938 (PE); Zhejiang: K.K. Tsooong 4531 (PE), J.X. Wang 1548 (PE); Shaanxi: G.Y. Bai 20 (KUN); Gansu: Y.Q. He 1337 (PE). Burma: Rains 1942 (K). Vietnam: Sino-Vietnam Exp. 24. 385 (KUN, PE).

Habitat: Epiphytic on tree trunks in forests at 750–1900 m altitude.

This species is different from *P. subfurfuracea* from the Himalayas in: laminae green and subglabrescent on undersurface, lanceolate, gradually narrowing towards both ends, decurrent at base, undersurface of laminae clothed with two layers of stellate hairs when young, hairs of lower layer consisting of grey, short, and indistinct frizzy rays, the hairs of superficial layer with brown, long-aciculate rays, deciduous, only a few brown hairs or occasionally some grey ones on stipes and leaf margin; rigid coriaceous in texture.

*Pyrrosia pseudocalvata* Ching was distinguished only by the feature that the fronds clothed with one layer of brown stellate hairs with aciculate rays, spores always empty or a few substantial contents in sporangia. The distribution area is limited outside of South and Southwest China, sometimes both meet-
ing in East Sichuan; perhaps it is a geographic race and they might be treated as two subspecies.


Specimens examined. Philippines: Bartsch 386, 443 (US), Clemens & Bolster 348 (GH), Edaño 12585 (MICH), Elmer 13597, 15892 (MICH), Ramos 1580, 42978, 48363 (MICH), Ramos et al. 75684, 83464 (MICH), H.F. Sun 45 (PE).

Habitat: Epiphytic in forests in lower elevations.

Larger plants; rhizome scales brown, long-subulate, entire; laminae broad lanceolate, widest at above the middle portion, short acute at apex, long-cuneate and decurrent at base; upper surface covered by stellate hairs with wooly rays; stellate hairs of lower surface trimorphic, superficial layer with light brown, aciculate rays, sometimes with a dark and long dorsal spine, the next layer with wooly rays; sori densely distributed on either side of midribs near marginal portion of 2–5 mm wide. This is different from *P. princeps* only in the stellate hairs with aciculate, not lanceolate rays on upper layer and with wooly rays on bottom layer, not glabrous.


Specimens examined. Sumatra: Iwatsuki et al. 168 (KYO), Lörzing 5761, 6078, 7128, 7733, 8901, 9453, 13840 (BO), Yates 6094, 8727 (BO), H.F. Sun 6907 (PE), Yates 1577, 2503 (K). Java: de Vries 72 (BO).

Habitat: Usually epiphytic at 600–1900 m altitude.

A quite characteristic species; rhizome scales obovate-lanceolate, short dentate at margin, attached at below the widest portion; fronds monomorphic, with very short stipes; laminae long-lanceolate, widest and round-truncate or sometimes almost cordate at base; lateral veins distinct at lower surface, upper surface smooth; induments usually monomorph, stellate hairs with acicular rays, sometimes mixed with sparsely wooly rays, sometimes with acicular and apical large, distinctly separated from each other and never confluent.


Type: Malaya, Roxburgh (Wallich 272) – *Niphopsis angustata* (Sw.) J. Smith, Cat. Ferns 6 (1857).


Habitat: Epiphytic on tree trunks, or very rarely terrestrial, at edge of forests at lower elevations below 1000 m alt.

Morton (1974) discussed on the type specimen of this species that the type was not from India but from Malaya.

When J. Smith (1857) established the genus *Niphopsis* basing on this species, he recognized rigid and coriaceous laminae with large and separate sori in a single row at each side of costae. The spore ornamentation gives an additional feature to show many linear ridges, contracted at each end to an abrupt beak. The following species from the Philippines has the same spore ornamentation, although the sori are sometimes slightly connivent each other.
when mature. Based on these features a taxon of subgeneric rank is warranted but not generic.


Specimens examined. Philippines: Cuming 323 (type; K, P), Edaño 3877, 3908 (MICH), Elmer 16872 (BO, MICH), Mendoza et al. 8630 (MICH), Merrill 5996 (GH), Mindoro 255 (MICH), Ramos 946 (type of *P. philippinensis* Copel., MICH), 30259 (BO, MICH), Santos 385 (MICH), Sulit 5159, 13934 (MICH), Weber 1181 (US).

Habitat: Epiphytic on tree trunks at low elevations.

Rhizome scales peltate, lanceolate, brown, with long grayish acumen, entire; fronds submonomorphic, stipes of sterile fronds nearly as long as fertile ones; fertile fronds broadly lanceolate, 20–35 cm long, 1–2 cm broad, widest near base, broadly cuneate at base, acute at apex, contracted into a beaked spike; indument dimorphic, upper surface glabrous, not puncticulate, lower surface covered with two layers of stellate hairs, superficial one brown, sparse, with aciculate rays, bottom layer white, thicker, with lanceolate, and mixed with several kinds of needle-like rays; sori usually apical, sometimes extending downwardly; spores tubercululate with ridges.

*Pyrrosia philippinensis* is identical with this species in habit, but the indument of Ramos 946 consist of only one layer of stellate hairs with lanceolate arms. It is not known at the moment if the superficial layer has been lost or not, as there is no such specimens available other than this.